Documentation of changes made to the economic assessment in response to review by the Office of Information and Regulatory Affairs (OIRA), Office of Management and Budget (OMB)

Note to the reader:

This document identifies changes made to the Executive Summary in response to OIRA review. Changes are highlighted. The complete final *Assessment* document is available elsewhere in this docket.

ASSESSMENT OF THE POTENTIAL COSTS, BENEFITS, & OTHER IMPACTS OF THE HAZARDOUS WASTE COMBUSTION MACT FINAL RULE STANDARDS

Economics, Methods, and Risk Analysis Division
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EXECUTIVE SUMMARY

OVERVIEW

In May of 1993, the Environmental Protection Agency (EPA) introduced a draft Waste Minimization and Combustion Strategy to address the combustion of hazardous waste and encourage reduced generation of these wastes. Among the key objectives of the strategy is the reduction of health and ecological risks posed by the combustion of hazardous waste. In September 1999, as part of this strategy, EPA issued a final rule establishing "maximum achievable control technology" (MACT) emissions standards for hazardous waste combustion facilities. In the "Cement Kiln Recycling Coalition v. EPA" decision in July 2001, the U.S. Court of Appeals ruled that EPA's final rule was in violation of Section 7412 of the Clean Air Act.[1] In response, EPA implemented Interim MACT standards in 2002 and is now establishing these Hazardous Waste Combustion (HWC) MACT final standards to address a variety of air pollutants, including dioxins/furans, particulate matter, mercury, semi-volatile and low-volatile metals, and chlorine. In addition, emissions of carbon monoxide and hydrocarbons will be regulated as proxies for non-dioxin, non-furan toxic organic emissions. The HWC MACT final standards establish emissions restrictions for commercial incinerators, on-site incinerators, waste-burning cement kilns, lightweight aggregate kilns (LWAKs), solid and liquid fuel boilers (including process heaters), and HCl production furnaces.

As part of the original 1999 Rulemaking, EPA conducted an Economic Assessment that examined and compared the costs and benefits of the 1999 Standards. The *Assessment of the Potential Costs, Benefits, and Other Impacts of the Hazardous Waste Combustion MACT Standards: Final Rule* (the 1999 *Assessment*) examined both the MACT floor and a more stringent "beyond-the-floor" (BTF) MACT option for dioxins/furans and mercury based on activated carbon injection technology (the "BTF-ACI" MACT option).[2] This document (*Assessment of the Potential Costs, Benefits, and Other Impacts of the Hazardous Waste Combustion MACT Replacement Standards: Final Rule*) is similar in scope to the 1999 *Assessment*, but analyzes the costs, benefits, and other impacts specific to the Final Rule, incremental to the baseline established by the 2002 Interim Standards.

In this document, we analyze the impacts of three MACT floor options reflecting different methods of measuring the performance of systems' emissions controls. These options are referred to as the Primary Floor Option, Alternative Floor Option 1, and Alternative Floor Option 2 throughout this document. We also examine the Final Rule Standards, which represent a beyond-the-floor version of the Primary Floor Option. Exhibit ES-1 lists the emission standards for existing

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[1] For complete text of the decision, refer to 255 F3d 855.

[2] U.S. EPA, *Assessment of the Potential Costs, Benefits, and Other Impacts of the Hazardous Waste Combustion MACT Standards: Final Rule*, Office of Solid Waste, July 1999.

sources by pollutant and combustion source category for the four MACT alternatives analyzed in this document.[3]

This assessment is designed to satisfy OMB's requirements for regulatory review under Executive Order 12866 (as amended by Executive Order 13258), which applies to any significant regulatory action. This document also fulfills the requirements of the following:

- The Regulatory Flexibility Act, as amended by the Small Business Regulatory Enforcement Fairness Act of 1996;
- Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations";
- Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks";
- The Unfunded Mandates Reform Act of 1995;
- Executive Order 13175, "Consultation and Coordination with Indian Tribal Governments";
- Executive Order 13132, "Federalism";
- Executive Order 12630, "Government Action and Interference with Constitutionally Protected Property Rights";
- Executive Order 13211, "Actions Concerning Regulations that Affect Energy Supply, Distribution, Or Use";
- Executive Order 12988, "Civil Justice Reform";
- Executive Order 13352, "Facilitation of Cooperative Conservation"; and
- Executive Order 13166, "Improving Access to Services for Persons with Limited English Proficiency."

[3] The standards for new sources are generally more stringent in controlling emissions than the standards for existing sources.

Exhibit ES-1

REGULATORY ALTERNATIVES FOR EXISTING SOURCES

MACT	Source Category	Chlorinated D/F (ng TEQ/dscm)[a]	PM	Hg (µg/dscm, or lb/MMBtu)	SVM (µg/dscm, or lb/MMBtu)	LVM (µg/dscm)	TCl (ppmv)[f]	CO (ppmv)	HC[b,c] (ppmv)
Final Rule Standards[m]	Incinerators	0.30 for dry APCDs or WHBs; 0.20 if APCD >400° F; 0.40 for others[d]	0.013 gr/dscf[j]	130 ug/dscm	200 ug/dscm	92 ug/dscm	32 ppmv	100	or 10
	Cement Kilns	0.20 or 0.40 and temperature control < 400°F at APCD inlet	0.028 gr/dscf	3.0 ppmw and 120 ug/dscm (HW MTEC feed restriction)[g] or 120 ug/dscm (total emissions)	330 ug/dscm[h] and 7.6E-4 lbs SVM in HW per MMBtu[i] in HW	2.2E-5 lbs LVM in HW per MMBtu[i] in HW	120 ppmv	100	or 10
								100	or 20
	LWAKs	0.2 or rapid quench of flue gas at exit to kiln to <400° F	0.025 gr/dscf	120 ug/dscm (HW MTEC or total emissions)[g]	250 ug/dscm[h] and 3.0E-4 lbs SVM in HW per MMBtu[i] in HW	110 ug/dscm[h] and 9.5E-5 lbs LVM in HW per MMBtu[i] in HW	600 ppmv	100	or 20
	Solid Fuel Boilers[e]	CO or HC and DRE standard as a surrogate	0.030 gr/dscf[j]	11 ug/dscm	180 ug/dscm	380 ug/dscm	440 ppmv	100	or 10
	Liquid Fuel Boilers[e]	0.4 for dry APCD sources; CO or HC and DRE standard as surrogate for others	0.035 gr/dscf[j]	10 ug/dscm[k] or 1.5E-5 lbs/MMBtu[k,i]	26 ug/dscm[k] or 2.5E-5 lbs SVM in HW per MMBtu[k,i] in HW	160 ug/dscm[l] or 1.6E-4 lbs LVM in HW per MMBtu[l,i] in HW	34 ppmv or 6,65E-2 lbs Cl in HW per MMBtu[i] in HW	100	or 10
	Hydrochloric Acid Production Furnaces[e]	CO or HC and DRE standard as surrogate	TCl as surrogate	TCl as surrogate	TCl as surrogate	TCl as surrogate	150 ppmv or 99.923% SRE	100	or 10

Exhibit ES-1

REGULATORY ALTERNATIVES FOR EXISTING SOURCES

MACT	Source Category	Chlorinated D/F (ng TEQ/dscm)[a]	PM	Hg (µg/dscm, or lb/MMBtu)	SVM (µg/dscm, or lb/MMBtu)	LVM (µg/dscm)	TCl (ppmv)[f]	CO (ppmv)	HC[b,c] (ppmv)
Primary Floor Option	Incinerators	0.30 for dry APCDs or WHBs; 0.20 if APCD >400° F; 0.40 for others[d]	0.013 gr/dscf[j]	130 ug/dscm	200 ug/dscm	92 ug/dscm	32 ppmv	100 or	10
	Cement Kilns	0.20 or 0.40 and temperature control at APCD inlet	0.028 gr/dscf	3.0 ppmw and 120 ug/dscm (HW MTEC feed restriction)[g] or 120 ug/dscm (total emissions)	330 ug/dscm[h] and 7.6E-4 lbs SVM in HW per MMBtu[i] in HW	2.2E-5 lbs LVM in HW per MMBtu[i] in HW	120 ppmv	100 or	10
								100 or	20
	LWAKs	0.20 or rapid quench of flue gas at exit of kiln to <400° F	0.025 gr/dscf	120 ug/dcsm (HW MTEC feed restriction)[g] or 120 ug/dscm (total emissions)	250 ug/dscm[h] and 3.0E-4 lbs SVM in HW per MMBtu[i] in HW	110 ug/dscm[h] and 9.5E-5 lbs LVM in HW per MMBtu[i] in HW	600 ppmv	100 or	20
	Solid Fuel Boilers[e]	CO or HC and DRE standard as surrogate	0.073 gr/dscf[j]	11 ug/dscm	180 ug/dscm	380 ug/dscm	440 ppmv	100 or	10
	Liquid Fuel Boilers[e]	3.3 for dry APCD sources; CO or HC and DRE standard surrogate for others	0.035 gr/dscf[j]	10 ug/dscm[k] or 1.5E-5 lbs/MMBtu[k,i]	26 ug/dscm[k] or 2.5E-5 lbs SVM in HW per MMBtu[k,i] in HW	160 ug/dscm[l] or 1.6E-4 lbs LVM in HW per MMBtu[l,i] in HW	34 ppmv or 6.65E-2 lbs Cl in HW per MMBtu[i] in HW	100 or	10
	Hydrochloric Acid Production Furnaces[e]	CO or HC and DRE standard as surrogate	TCl as surrogate	TCl as surrogate	TCl as surrogate	TCl as surrogate	150 ppmv or 99.923% SRE	100 or	10

Exhibit ES-1

REGULATORY ALTERNATIVES FOR EXISTING SOURCES

MACT	Source Category	Chlorinated D/F (ng TEQ/dscm) [a]	PM	Hg (µg/dscm, or lb/MMBtu)	SVM (µg/dscm, or lb/MMBtu)	LVM (µg/dscm)	TCl (ppmv) [f]	CO (ppmv)	HC [b,c] (ppmv)
Alternative Floor Option 1	Incinerators	0.30 or 0.20 for dry APCD or WHB sources if APCD > 400°F;[d] 0.40 for others	0.013 gr/dscf [j]	130 ug/dscm	22 ug/dscm	21 ug/dscm	47 ppmv	100 or	10
	Cement Kilns	0.20 or 0.40 > 400°F at inlet to PM control device	0.028 gr/dscf	3.0 ppmv and 120 ug/dscm (HW MTEC feed restriction)[g] or 120 ug/dscm (total emissions)	1.3E-4 lbs SVM in HW per MMBtu[i] in HW	1.4E-5 lbs LVM in HW per MMBtu[i] in HW	120 ppmv	100 or	10
								100 or	20
	LWAKs	0.20 or rapid quench of flue gas at exit of kiln to less than 400°F	0.025 gr/dscf	120 ug/dscm (HW MTEC feed restriction)[g] or 120 ug/dscm (total emissions)	3.0E-4 lbs SVM in HW per MMBtu[i] in HW and 250 ug/dscm[h]	9.5E-5 lbs LVM in HW per MMBtu[i] in HW and 110 ug/dscm[h]	600 ppmv	100 or	20
	Solid Fuel Boilers [e]	CO or HC and DRE standard as a surrogate	0.073 gr/dscf [j]	11 ug/dscm	180 ug/dscm	380 ug/dscm	440 ppmv	100 or	10
	Liquid Fuel Boilers [e]	3.3 for dry APCD sources; CO or HC and DRE standard surrogate for others	0.035 gr/dscf	10 ug/dscm[k] or 1.5E-5 lbs/MMBtu[k,i]	26 ug/dscm[k] or 2.5E-5 lbs SVM in HW per MMBtu[k,i] in HW	1.2 E-4 lbs LVM per MMBtu in HW or 30 ug/dscm	34 ppmv or 6.65E-2 lbs Cl in HW per MMBtu[i] in HW	100 or	10
	Hydrochloric Acid Production Furnaces [e]	CO or HC and DRE standard as surrogate	TCl as surrogate	TCl as surrogate	TCl as surrogate	TCl as surrogate	150 ppmv or 99.923% SRE	100 or	10

Exhibit ES-1

REGULATORY ALTERNATIVES FOR EXISTING SOURCES

MACT	Source Category	Chlorinated D/F (ng TEQ/dscm) [a]	PM	Hg (µg/dscm, or lb/MMBtu)	SVM (µg/dscm, or lb/MMBtu)	LVM (µg/dscm)	TCl (ppmv) [f]	CO (ppmv)	HC [b,c] (ppmv)
Alternative Floor Option 2	Incinerators	0.30 or 0.20 for dry APCD and WHB sources if APCD >400°F;[d] 0.40 for others	0.0037 gr/dscf [j]	130 ug/dscm	22 ug/dscm	21 ug/dscm	47 ppmv	100 or	10
	Cement Kilns	0.20 or 0.40 and temperature control <400°F at APCD inlet	0.014 gr/dscf	32 ug/dscm	68 ug/dscm	11 ug/dscm	41 ppmv	100 or	10
								100 or	20
	LWAKs	0.20 or rapid quench of flue gas at exit of kiln to less than 400°F	0.025 gr/dscf	19 ug/dscm	250 ug/dscm	104 ug/dscm	600 ppmv	100 or	20
	Solid Fuel Boilers [e]	CO or HC and DRE standard as surrogate	0.072 gr/dscf [j]	11 ug/dscm	180 ug/dscm	380 ug/dscm	440 ppmv	100 or	10
	Liquid Fuel Boilers [e]	3.3 for dry APCD; CO or HC and DRE standard as surrogate for others	0.0025 gr/dscf [j]	0.70 ug/dscm[k]	9 ug/dscm[k]	34 ug/dscm (Cr only)[l]	33 ppmv	100 or	10
	Hydrochloric Acid Production Furnaces [e]	CO or HC and DRE standard as surrogate	TCl as surrogate	TCl as surrogate	TCl as surrogate	TCl as surrogate	32 ppmv	100 or	10

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REGULATORY ALTERNATIVES FOR EXISTING SOURCES

MACT	Source Category	Chlorinated D/F (ng TEQ/dscm) [a]	PM	Hg (µg/dscm, or lb/MMBtu)	SVM (µg/dscm, or lb/MMBtu)	LVM (µg/dscm)	TCl (ppmv) [f]	CO (ppmv)	HC [b,c] (ppmv)

Notes:

[a] Across all options, a DRE of 99.99% is required for each principal organic hazardous pollutant. For sources burning hazardous wastes F020, F021, F022, F023, F026, or F027, however, 99.9999% is required for each principal organic hazardous pollutant.

[b] Across all options, sources have the option to continuously comply with a CO standard of 100 ppmv in lieu of complying with the HC standard. Sources that choose to do this, however, must demonstrate compliance with the HC standard during the comprehensive performance test.

[c] Across all options, cement kilns without a bypass must comply with either 20 ppmv HC or 100 ppmv CO. Cement kilns with a bypass/mid-kiln sampling system must comply with either 10 ppmv HC or 100 ppmv CO in the bypass duct, mid-kiln sampling system or bypass stack.

[d] APCD denotes "air pollution control device." WHB denotes "waste heat boiler."

[e] Particulate matter, semi-volatile metal, low volatile, and total chlorine standards apply to major sources only for solid fuel-fired boilers, liquid fuel-fired boilers, and hydrochloric acid production furnaces.

[f] For all sources except hydrochloric acid production furnaces, sources may elect to comply with site-specific risk-based emission limits for hydrogen chloride and chlorine gas.

[g] MTEC denotes maximum theoretical emission concentration, and is equivalent to the feed rate divided by gas flow rate.

[h] Sources must comply with both the thermal emissions and emission concentration standards.

[i] Standards expressed as mass of pollutant contributed by hazardous waste per million Btu contributed by the hazardous waste.

[j] Sources may elect to comply with an alternative to the particulate matter standard.

[k] Standard is based on normal emissions data, resulting in an annual average compliance period.

[l] Low volatile metal standard for liquid fuel-fired boilers is for chromium only.

[m] Shaded cells indicate that the standards represent beyond-the-floor levels compared with Option A.

SUMMARY OF FINDINGS

This assessment estimates the costs and benefits of EPA's HWC MACT final standards for hazardous waste combustion facilities. We estimate costs and economic impacts under two scenarios: a market-adjusted scenario and an engineering cost scenario. Under the market-adjusted scenario, we assume that the hazardous waste combustion market adjusts to the costs associated with the final standards. Potential adjustments include increasing commercial combustion prices, sending waste offsite rather than upgrading to comply with the standards, and (for facilities with multiple combustion systems) consolidating hazardous waste combustion systems. In contrast, under the engineering cost scenario, we assume that all facilities upgrade to comply with the standards, regardless of cost.

The central conclusions of our analyses are as follows:

- **We estimate $27.5 million in annual social costs under the Final Rule Standards, with a conservative estimate of $43.5 million if we assume that no facilities change their waste management practices in response to the standards.** Total social costs associated with the options examined in this document range from $26.3 to $52.0 million annually, and are not expected to exceed $70.5 million if all systems upgrade to comply with the most stringent option.[4]

- **Social costs under the market-adjusted scenario are substantially lower than costs under the engineering cost scenario.** Because the market-adjusted scenario reflects the cost-minimizing behavior of facilities directly affected by the standards, costs under the market-adjusted scenario for the Final Rule Standards are approximately 37 percent lower than the conservative engineering costs associated with upgrading all facilities to comply with the standards.

- **Government administrative costs are estimated at $459,500 per year under the Final Rule Standards, with a conservative estimate under the engineering cost scenario of $503,000 per year.** These government costs reflect administration and enforcement activities associated with systems not regulated under the 2002 Interim Standards.

- **Nearly all systems expected to stop burning hazardous waste in response to the final standards are non-commercial systems.** Under the market-adjusted scenario for the Final Rule Standards, we expect the following market exits: up to two commercial incinerator systems, 23 to 24 on-site incinerator systems, and 11 liquid boiler systems. We do not anticipate that

[4] All dollar values presented in this assessment are 2002 dollars.

any cement kiln, lightweight aggregate kiln, coal boiler, or HCl production furnace systems will exit the market in response to the final standards.

- **Under the Final Rule Standards, market exit and waste consolidation activity is expected to result in the reallocation of approximately 47,100 to 53,200 tons of waste from combustion systems that stop burning.** This represents between 1.2 and 1.4 percent of total combusted wastes in the current universe. Approximately 38,900 tons of this waste will likely be rerouted to off-site commercial facilities as on-site systems exit the market. The remaining waste will continue to be treated on site at facilities that consolidate their hazardous waste combustion systems.

- **We expect combustion facilities to experience positive and negative employment impacts as a result of the standards.** As some facilities stop burning hazardous waste in individual combustion systems in response to the standards and others invest in additional pollution control and monitoring equipment, there are likely to be positive and negative employment impacts at different facilities. At facilities that consolidate their combustion operations or that stop burning hazardous waste altogether, we estimate employment dislocations ranging from 265 to 272 full-time equivalent employees under the Final Rule Standards. We also expect positive employment impacts of approximately 350 full-time equivalent employees as several other facilities invest in new pollution control equipment.

- **Combustion prices may increase modestly as commercial facilities face higher costs.** Under the market-adjusted scenario (in which commercial facilities increase their prices to cover compliance costs), prices are expected to increase by less than one percent under the Final Rule Standards. This increase would affect both "new customers" that are closing on-site combustion systems and also existing consumers of hazardous waste combustion services.

- **The final standards are expected to yield measurable human health benefits.** The HWC MACT final standards are expected to result in $5.6-$6.3 million per year in human health benefits under the Final Rule Standards, depending on discounting assumptions. The final standards are also likely to yield other benefits that we were unable to monetize.

- **Potential ecological improvements.** Water and terrestrial ecosystems may experience some limited benefits as a result of the final standards.

- **Waste minimization.** We do not expect the final standards to result in significant waste minimization in the short run. However, more substantial

waste minimization may occur in the long run as facilities design and/or adopt new production technologies in response to higher hazardous waste combustion costs. These technologies may result in the increased generation of non hazardous waste, in partial substitute to previous hazardous waste generation.

Exhibit ES-2 summarizes our estimates of monetized costs and benefits associated with the final standards and the other three MACT options we examined. The exhibit shows that across all regulatory options, costs exceed monetized benefits. However, the HWC MACT standards are expected to yield other benefits that are not expressed in monetary terms. These include health benefits associated with reduced lead, mercury, and chlorine emissions and ecological improvements to terrestrial and aquatic ecosystems. The full range of impacts associated with these standards also includes equity-enhancing effects such as environmental justice and impacts on children's health. Consequently, EPA's final regulatory decision with respect to the final standards considers both monetized and non-monetized benefits, efficiency impacts, and equity concerns. The remainder of this executive summary provides more detail on the basis for these conclusions.

Exhibit ES-2

COMPARISON OF SOCIAL COSTS AND BENEFITS[a]
(millions of 2002 dollars)

	Annual Social Cost Estimates[b]		Annual Benefits Estimates[c]		
MACT Option	Market Adjusted	Engineering Costs	Non-discounted	Three Percent Discount Rate	Seven Percent Discount Rate
Final Rule Standards	$27.5	$43.5	$6.3	$6.0	$5.6
Primary Floor Option	$26.3	$42.3	$6.3	$5.9	$5.6
Alternative Floor Option 1	$33.3	$50.0	$6.3	$5.9	$5.6
Alternative Floor Option 2	$51.9 - $52.0	$70.5	$10.3	$9.7	$9.1

Notes:

[a] These estimates reflect EPA's decision to allow all facilities, except for HCl production furnaces, to choose between technology-based emissions limits for chlorine and site-specific, risk-based chlorine emissions standards. In developing the final standards, however, EPA considered versions of the standards that would require all facilities to comply with the technology-based emissions limits. The costs and economic impacts of these regulatory alternatives are presented in Appendix C.

[b] Social cost estimates include government administrative costs. Government costs for our market-adjusted estimate range from approximately $447,500 to $459,500 per year, and government costs for our conservative engineering cost estimate are approximately $503,000.

[c] Benefits estimates do not include some benefits we were unable to monetize, such as health improvements for children, subsistence fishermen, and commercial beef and dairy farmers as well as potential ecological improvements. Therefore the benefits presented in this exhibit underestimate the total benefits associated with the HWC MACT standards.

ENGINEERING COMPLIANCE COST ANALYSIS

Total HWC MACT compliance costs for existing hazardous waste combustion facilities will depend on the pollution control measures necessary for compliance at individual combustion systems and the costs associated with these measures. To estimate these costs, we developed an engineering model that identifies the pollution control technologies required by each individual system. Based on the technologies selected, the model then generates system-specific estimates of HWC MACT compliance costs. In addition to these pollution control costs, the model includes other compliance costs associated with monitoring requirements, sampling and analysis, permit modifications, and other record keeping and reporting requirements. Some of these component costs may be specific to individual combustion systems, while others are consistent across all systems within a source category (e.g., cement kilns) or across the entire HWC MACT universe. Exhibit ES-3 describes the different steps included in our compliance cost methodology. The results of this analysis are summarized in Exhibit ES-2 as the "engineering cost" estimates. Additional results include the following:

- Liquid boilers have the highest per system compliance costs under each of the regulatory options considered in this document, with the exception of Alternative Floor Option 2, under which average costs per system are highest for cement kilns. Per system compliance costs are lowest for LWAKs across all regulatory options other than Alternative Floor Option 2. Under this option, per system costs are lowest for on-site incinerators.

- Government administrative costs, borne primarily by EPA offices and state environmental agencies, total $503,244 per year if all systems upgrade to comply with the final standards.

Compliance costs vary significantly across individual combustion systems within a given source category. The following compliance cost results for the Final Rule Standards illustrate the wide variability across specific types of combustion systems:[5]

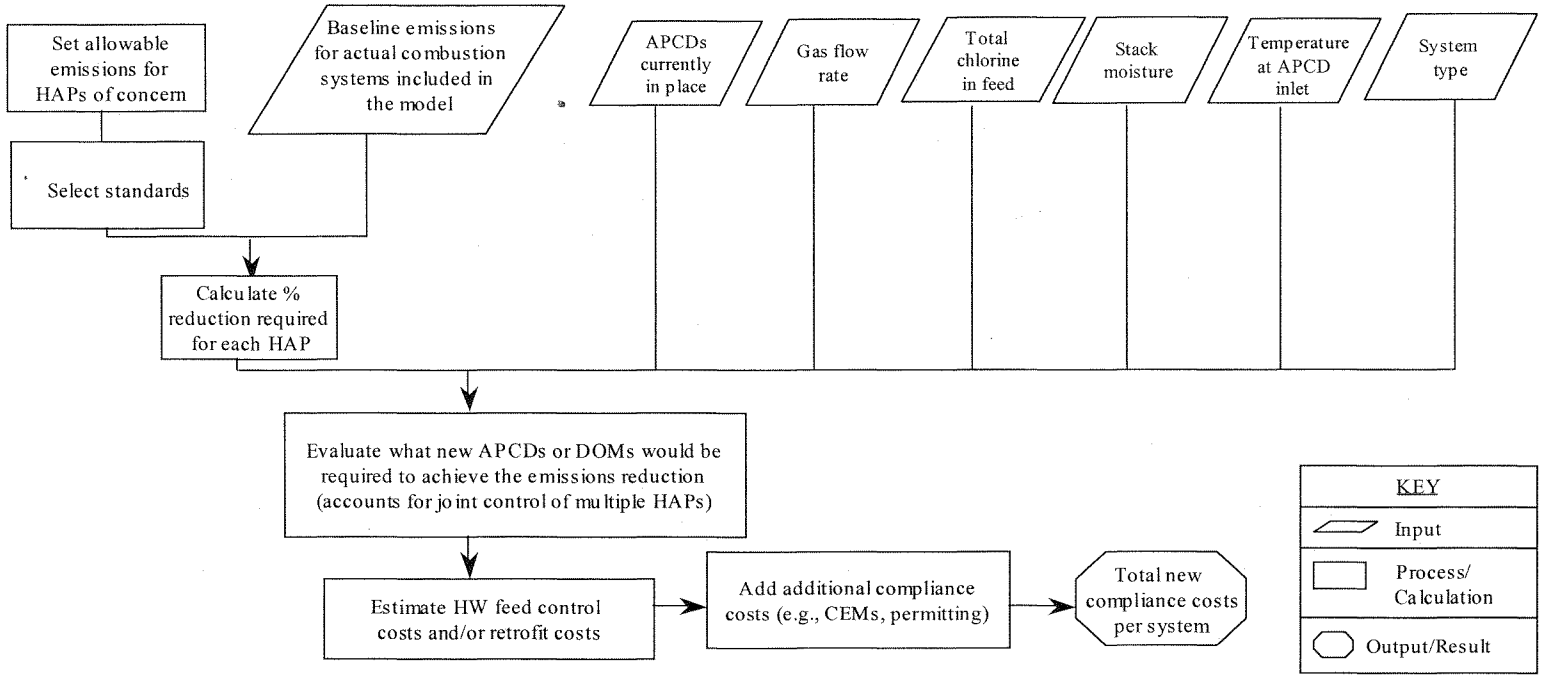
- **Cement Kilns** -- Annual per-system compliance costs range from $0 to $718,100 with an average cost of $113,600 per system.[6]

[5] These compliance cost estimates do not include administrative costs incurred by facilities, including performance testing costs and permitting costs. These costs are examined in Chapter 4 of this document.

[6] The compliance cost estimates for cement kilns do not take into account requirements established under the Portland Cement MACT, which addresses non-hazardous cement kilns. If the Portland Cement MACT is accounted for in these estimates, the compliance costs for cement kilns under the HWC MACT final standards may be lower.

Exhibit ES-3

OVERVIEW OF SYSTEM-SPECIFIC COMPLIANCE COST ANALYSIS



NOTES

1. Setting of allowable emissions for hazardous air pollutants (HAPs) based on MACT analysis using Trial Burn Reports. Baseline emissions also determined using Trial Burn Reports (measured at the stack) and imputation. See U.S. EPA, *Technical Support Document for the HWC MACT Standards, Volume II: HWC Database,* September 2005.
2. All other data inputs from U.S. EPA, *Technical Support Document for the HWC MACT Standards, Volume II: HWC Database,* September 2005.
3. A DOM is a design, operation, or maintenance change to an existing Air Pollution Control Device (APCD). CEMs are continuous emission monitoring systems.

- **Commercial Incinerators** -- Annual per-system compliance costs range from $14,200 to $127,500, with an average cost of $55,400 per system.

- **LWAKs** -- Annual per-system compliance costs range from $0 to $18,600, with an average cost of $3,300 per system.

- **On-Site Incinerators** -- Annual per-system compliance costs range from $0 to $89,500, with an average cost of $14,300 per system.

- **Liquid Boilers** – Annual per-system compliance costs range from $0 to $1,603,700, with an average of $274,200 per system.

- **Coal Boilers** – Annual per-system compliance costs range from $67,700 to $315,100, with an average of $170,200 per system.

- **HCl Production Furnaces** – Annual per-system compliance costs range from $0 to $130,400, with an average of $16,600.

SOCIAL COST AND ECONOMIC IMPACT ANALYSIS

The social costs of the HWC MACT standards include the value of resources used by the private sector, to comply with the standards, costs to government to administer the standards, and the value of output lost due to shifts in resources to less productive uses. As explained in more detail in Chapter 5, we estimate the value of the private sector resource shifts using a simplified approach designed to bracket the welfare loss attributable to the MACT standards. The conservative estimate of the economic welfare loss range is consistent with the engineering cost scenario described above, under which all combustion facilities are assumed to continue managing hazardous waste on site and upgrade to comply with the MACT standards. In contrast, our market-adjusted cost estimates reflect potential changes in facilities' waste management practices as well as potential price changes at commercial facilities.

The results of our social cost analysis are presented in Exhibit ES-4. As the exhibit indicates, annual social costs range between $26.3 and $52.0 million across regulatory options, with a conservative estimate of $70.5 million under Alternative Floor Option 2, reflecting upgrades under the engineering cost scenario. Under the Final Rule Standards, the best estimate of the total social costs of the rule is $27.5 million, compared to our conservative estimate of $43.5 million. Total government costs represent between one and two percent of total social costs across all MACT options.

Exhibit ES-4

SUMMARY OF ANNUAL SOCIAL COST ESTIMATES [a,b]
(millions of 2002 dollars)

	Best Estimate (Market-Adjusted Scenario)	Conservative Estimate (Engineering Cost Scenario)
Final Rule Standards	$27.5	$43.5
Primary Floor Option	$26.3	$42.3
Alternative Floor Option 1	$33.3	$50.0
Alternative Floor Option 2	$52.0	$70.5

Notes:

[a] Government administrative costs are included in the social cost estimates. Government costs for our best estimate range from $447,500 to $459,500 per year, depending on the compliance option. For the conservative estimate, under which all systems upgrade, annual government costs are approximately $503,000.

[b] These estimates reflect EPA's decision to allow all facilities, except for HCl production furnaces, to choose between technology-based emissions limits for chlorine and site-specific, risk-based chlorine emissions standards. In developing the final standards, however, EPA considered versions of the standards that would require all facilities to comply with the technology-based emissions limits. The costs and economic impacts of these regulatory alternatives are presented in Appendix C.

BENEFITS ASSESSMENT

The benefits associated with the HWC MACT final standards include the avoidance of a variety of adverse health impacts, including premature mortality, chronic bronchitis, acute bronchitis, upper and lower respiratory conditions, pollution-related work loss days, minor restricted activity days, and hospital admissions associated with respiratory or cardiovascular disease. The standards also are expected to improve visibility and may improve the health of aquatic and terrestrial ecosystems.

To assess these benefits, we scaled the results of the 1999 *Assessment* to reflect current conditions and emissions reductions achieved under the final standards.[7] Since the 1999 *Assessment* was completed, several facilities have either closed or stopped burning hazardous waste; therefore, we incorporate such changes in the HWC MACT universe into our estimates of the benefits associated with the final standards. Similarly, the emissions reductions expected under the final standards are different than those associated with the 1999 Standards, even for facilities that still burn hazardous waste. Our analysis accounts for these differences.

[7] Since the completion of the 1999 *Assessment*, EPA has updated its methods for evaluating human health benefits to reflect recent advances in air quality modeling and human health benefits modeling. This *Assessment* incorporates some of these updates, but not all. Chapter 6 describes these updates in detail and specifies which ones are reflected in the current analysis.

To measure the value of human health benefits, we assign a monetary value to avoided cases of each health endpoint included in the risk assessment. For mortality benefits, we apply the value of a statistical life (VSL), which is based on an individual's willingness to pay (WTP) to reduce the risk of premature death. We also used WTP estimates for most morbidity effects, but in cases where WTP estimates were not available we used cost-of-illness estimates reflecting the average medical costs associated with the effect (e.g., hospitalization costs, pharmaceutical expenditures, etc.).

Exhibit ES-5 presents the human health benefits associated with the HWC MACT final standards. As the exhibit indicates, most of the human health benefits resulting from the standards are related to reduced PM emissions. These benefits include 0.45 to 0.75 fewer premature deaths per year, valued at approximately$2.8 to $4.7 million per year.[8] Reduced PM emissions also yield benefits associated with avoided morbidity effects. Our estimates of these benefits include (on an annual basis) between 1.7 and 2.8 avoided hospital admissions associated with respiratory and heart conditions and between 71 and 117 avoided cases of chronic bronchitis, acute bronchitis, and upper and lower respiratory conditions. We also estimate the avoidance of between 613 and 1,007 work loss days per year and 5,103 to 8,391 minor restricted activity days per year. We estimate that these morbidity-related benefits range in value from $3.4 to $5.6 million across the regulatory options presented in this document. Reductions in lead and mercury emissions may provide some additional health benefits, particularly for children, subsistence fishermen, and commercial beef and dairy farmers living in close proximity to hazardous waste combustion facilities.

Exhibit ES-5

HUMAN HEALTH BENEFITS SUMMARY: REDUCTION IN ANNUAL INCIDENCE OF ADVERSE HEALTH EFFECTS

Type of Benefit	Final Rule Standards	Primary Floor Option	Alternative Floor Option 1	Alternative Floor Option 2
PM-related Health Benefits				
Premature mortality	0.46	0.455	0.45	0.75
Respiratory Illness Hospital Adm.	1.21	1.20	1.20	1.97
Cardiovascular Disease Hospital Adm.	0.53	0.52	0.52	0.87
Chronic Bronchitis	7.70	7.65	7.65	12.54
Acute Bronchitis	5.86	5.81	5.81	9.60
Lower Respiratory Symptoms	51.95	51.53	51.53	85.15
Upper Respiratory Symptoms	6.02	5.98	5.98	9.88
Minor Restricted Activity Days	5,141.79	5,103.34	5,103.34	8,391.36
Work Loss Days	617.22	612.60	612.60	1,007.29
Dioxin-related Health Benefits				
Dioxin-related cancer deaths	0.005	0.004	0.004	0.004

[8] A fraction of an avoided death is not a possible outcome for any given year. The 0.45 to 0.75 avoided deaths estimated for this analysis represents the average number of avoided deaths per year. For example, 0.75 avoided deaths per year would correspond to three avoided deaths over a period of four years (3 avoided deaths / 4 years =0.75 avoided deaths per year).

Visibility is also expected to improve because of PM emissions reductions achieved under the final standards. Due to resource constraints, EPA was unable to conduct an air quality modeling analysis to quantify the visibility improvements that may result from the final standards. Therefore, visibility improvements are not reflected in the primary benefits estimates presented in this *Assessment*. As a supplement to the primary benefits estimates, however, we generated high-end and low-end estimates of visibility benefits associated with the HWC MACT final standards using the visibility benefits estimated in EPA's 1999 analysis of the Clean Air Act.[9] Based on the results presented in this analysis, we estimate visibility benefits ranging from $0.2 to $9.3 million per year across the HWC MACT standards included in this document.

Ecological improvements may also result from the final standards. The 1999 MACT standards were projected to reduce potential ecosystem risks for 38 square kilometers of water and 115 to 147 square kilometers of land. Because the emissions reductions expected under the 1999 Standards exceed the emissions reductions resulting from the final standards, we do not expect the ecological benefits of the final standards to exceed the improvements associated with the 1999 Standards. That is, we expect less than 38 square kilometers of water and 115 to 147 square kilometers of land to experience reduced risks as a result of the final standards.

It is important to note that benefits for certain more highly exposed sub-populations who may face proportionally greater risks, namely children, low-income individuals, minorities, subsistence fishermen, and commercial beef and dairy farmers, could not be estimated in the risk assessment. As a result, our monetized benefits estimates do not reflect benefits realized by these individuals. Our monetized results also do not include the value of ecological benefits associated with the final standards because we cannot translate the potential improvements into an end-point benefit measure, such as increased fish populations, for which a benefits transfer approach could assign monetary values. Our monetized benefits, therefore, do not reflect the full range of benefits expected from this rule.

OTHER REGULATORY ISSUES

As part of our analysis of the final standards, we assessed potential equity impacts related to the following:

- **Regulatory Flexibility.** The HWC MACT final standards will not have a significant impact on a substantial number of small entities. Only eight of the 145 combustion facilities (six percent) are classified as small businesses. The conservative compliance cost estimates (i.e., those associated with the engineering cost scenario) under the Final Rule Standards represent less than 1 percent of total sales for all combustion facilities considered a small business.

[9] U.S. EPA, *The Benefits and Costs of the Clean Air Act: 1990 to 2010*, November 1999.

- **Environmental Justice Analysis.** The HWC MACT standards should not have any adverse environmental or health effects on minority or low-income populations. Any impacts the rule has on these populations are likely to be positive because the rule will potentially reduce emissions from combustion facilities near minority and low-income population groups.

- **Children's Health Protection Analysis.** Although we have not quantitatively assessed the impacts of the HWC MACT final standards on children's health, qualitative analysis indicates that children would benefit from this rule.

- **Joint Impacts of Rules.** Facilities in the HWC MACT universe are affected by a number of regulations. However, some of these regulations are not expected to have an aggregate impact on regulated facilities.

- **Unfunded Federal Mandates.** Based on these criteria set forth by the Unfunded Mandates Reform Act (UMRA), the HWC MACT standards do not contain a significant unfunded mandate. Compliance with the rule is voluntary for non-federal governmental entities since state and local agencies choose whether to apply to EPA for the permitting authority necessary to implement the HWC MACT final standards.

- **Tribal Governments Analysis.** Although there is no specific metric for determining whether a regulation "significantly or uniquely affects" an Indian tribal government, the final standards are not expected to impose substantial direct compliance costs on tribal governments and their communities.

- **Federalism.** The HWC MACT standards do not have federalism implications. They will not have direct financial effects on the States because EPA will be responsible for permitting and monitoring hazardous waste combustion facilities. Furthermore, these standards should not alter the relationship between the national government and the States because the States may voluntarily apply for permitting authority in order to implement the HWC MACT final standards. Finally, the standards do not preempt State law because States may still develop air pollution laws that exceed the stringency of the Final Rule.

- **Regulatory Takings.** Based on our review of relevant case law, the HWC MACT final standards are not likely to result in any regulatory takings. The rule will not require that private property be invaded or taken for public use.

- **Energy Impact Analysis.** This rule is not a "significant energy action" as defined by Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use" because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy.

- **Civil Justice Analysis.** The Final Rule meets applicable standards in sections 3(a) and 3(b)(2) of Executive Order 12988, "Civil Justice Reform" (February 5, 1996), to minimize litigation, eliminate ambiguity, and reduce burden. EPA actions to meet the requirements of the Order include, but are not limited to, the following: unambiguous specification of the standards, establishment of clear compliance deadlines for regulated facilities, and a description of the effect of the standards on existing law.

- **Facilitation of Cooperative Conservation.** In developing the final standards, EPA considered public comments on the proposed rule from a number of State and local governments and private organizations. In addition, non-federal government entities, such as the States, may voluntarily apply for permitting authority to implement the rule. They may also develop air pollution laws that exceed the stringency of the HWC MACT final standards.

- **Improving Access to Services for Persons with Limited English Proficiency (LEP).** The Final Rule is consistent with principles set forth in Executive Order 13166, "Improving Access to Services for Persons with Limited English Proficiency (LEP)" (August 11, 2000).